

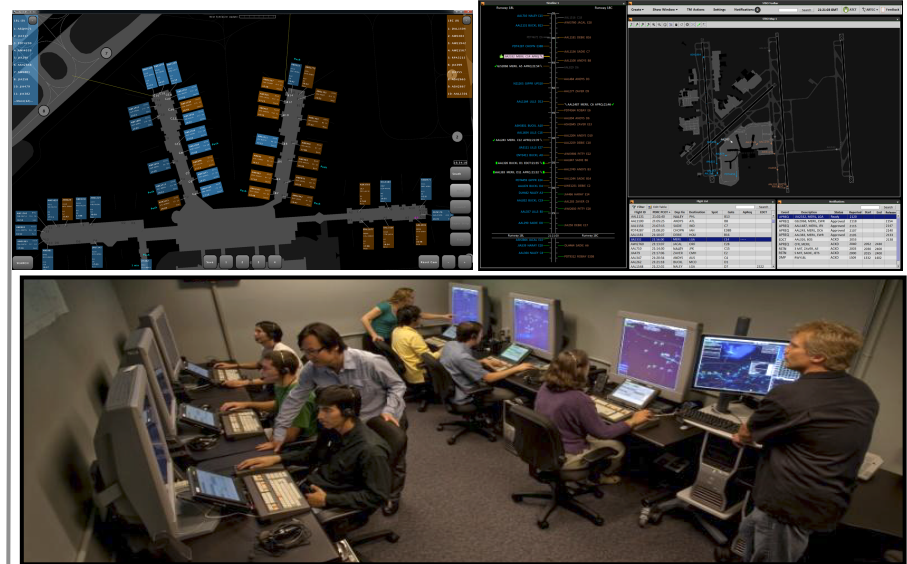
ATD-2 HITL Experiment Plans

Savvy Verma
10/24/2016

- Role as Experiment lead
- Role of Shadow sessions
- Example of storyboarding
- Experiment Plan for TSTR
- Experiment Plan for MATS
- Experiment Plan for ISAS

Objective

- Obtain feedback from users to enhance and improve the ATD-2 tools in the AAL Ramp, CLT ATCT, and ZDC Center for Phase 1
- Support/Lead Shadow Evaluations to obtain feedback from end users
- Design and develop a HITL simulation environment to evaluate the ATD-2 tools with end users as participants
- Represent the end user/customer in the agile software development process



Approach

- Conduct HITL at Future Flight Central (FFC) and Airspace Operations Lab (AOL)
 - Simulated traffic will include uncertainties
- Shadow Evaluations used to obtain feedback from end users on design of new features of ATD-2 tools before s/w development
- Participants include CLT AAL Ramp Controllers/Managers, CLT ATCT TMC and Controllers, and Retired Controllers/ SMEs

Highlights

- CLT EDC Evaluation & Demonstration successfully tested in Sept 2015
- Tactical Surface Ramp Tool successfully tested in April 2016
- New design of STBO Client presented to ATCT in July 2016 Shadow evaluation
- Shadow Evaluation of Ramp Tools conducted in Aug 2016
- Shadow Evaluation focusing on data integration and exchange in Sept 2016

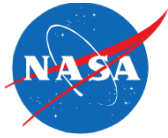
Story Boarding

Runway Request for Operational Necessity Proposal



- What
 - Runways requested for operational necessity by ramp or pilot
- Who
 - Ramp or Tower (at pilots' requests)
- When
 - As soon as it is known
- How
 - Ramp or Tower changes runway on aircraft that has operational necessity
 - Runway change made on RTC will be sent to STBO client and the flight will be marked both in the the timeline and the flight table as having requested OpNec
- Required capability
 - Current procedures and ability to change runway
- Potential stakeholders (folks who may benefit)
 - ATCT, FAA Center, Ramp, IOC, Airport Ops
- Required Formal Procedures
 - TBD

Runway Request for Operational Necessity Proposal



- What
 - Runways requested for operational necessity by ramp or pilot
- Who
 - Ramp or Tower (at pilots' requests)
- When
 - As soon as it is known
- How
 - Ramp or Tower changes runway on aircraft that has operational necessity
 - Runway change made on RTC will be sent to STBO client and the flight will be marked both in the the timeline and the flight table as having requested OpNec
- Required capability
 - Current procedures and ability to change runway
- Potential stakeholders (folks who may benefit)
 - ATCT, FAA Center, Ramp, IOC, Airport Ops
- Required Formal Procedures
 - TBD

Flight at Gate with
Push Advisory

Flight Pushback

Flight at Gate
With Advised
Hold Time

Red Border
Indicates Hold
&
Hold Timer
Counting down



Double click on flight on RTC to open flight menu

AAL 1223 Flight Menu

Edit Call sign

Edit Tail Number

Assign

☐ North Hardstand
 ☐ West Hardstand
 ☐ Mike Charlie Bypass

☐ Critical Flight
 ☐ Flight Cancelled
 ☐ Flight Delayed min

Update TMI

: EDCT
 : CFR

Select to add:

☐ Gate
 ☐ Fix
 ☐ Spot
 ☐ Runway
 ☐ Operational Necessity

Scheduler Status

☐ Normal
 ☐ Temporarily Inactive
 ☐ Removed from Service
 ☐ Do Not Remove Icon
 ☐ Remove Icon

Cancel

Apply

Select runway update here

Taxi for Operational necessity option is greyed out until a runway update is selected

Select desired choice of Runway from drop down



AAL 1223 Flight Menu

Edit Call sign X

Edit Tail Number X

Assign
☐ North Hardstand
☐ West Hardstand
☐ Mike Charlie Bypass

☐ Critical Flight
☐ Flight Cancelled
☐ Flight Delayed min

Update TMI
 : EDCT
 : CFR

Select to add:

Gate
 Fix
 Spot
 Runway ☐ Operational Necessity

18L
18R
18C
23

Scheduler Status
☐ Normal
☐ Temporarily Inactive
☐ Removed from Service
☐ Do Not Remove Icon
☐ Remove Icon

Cancel
Apply

Select corrected information from drop down

AAL 1223 Flight Menu

Edit Call sign X

Edit Tail Number X

Assign
☐ North Hardstand
☐ West Hardstand
☐ Mike Charlie Bypass

☐ Critical Flight
☐ Flight Cancelled
☐ Flight Delayed min

Update TMI

: EDCT
 : CFR

Select to add:

Gate
 Fix
 Spot
 Runway
☒ Operational Necessity

Scheduler Status
☐ Normal
☐ Temporarily Inactive
☐ Removed from Service

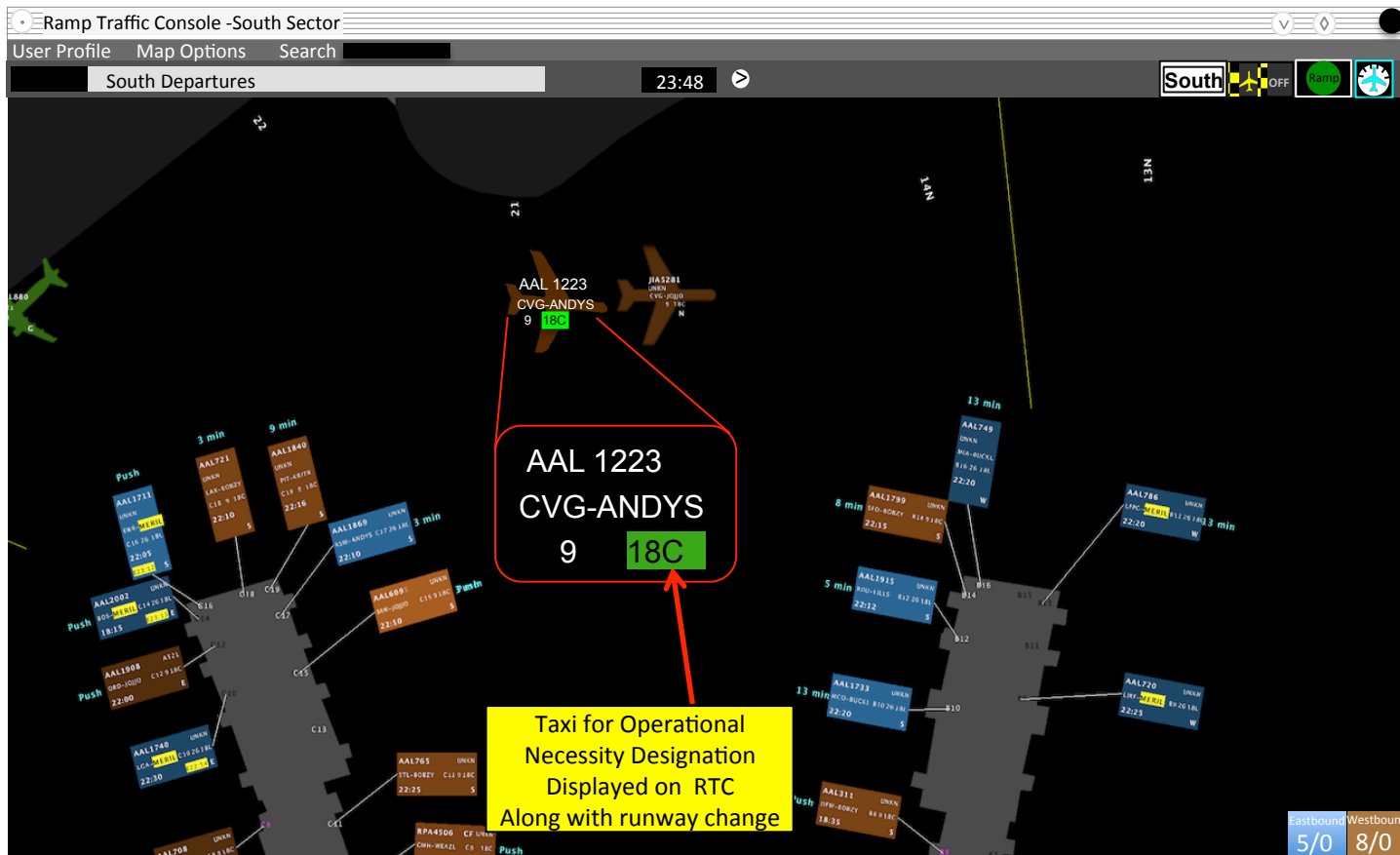
☐ Do Not Remove Icon
☐ Remove Icon

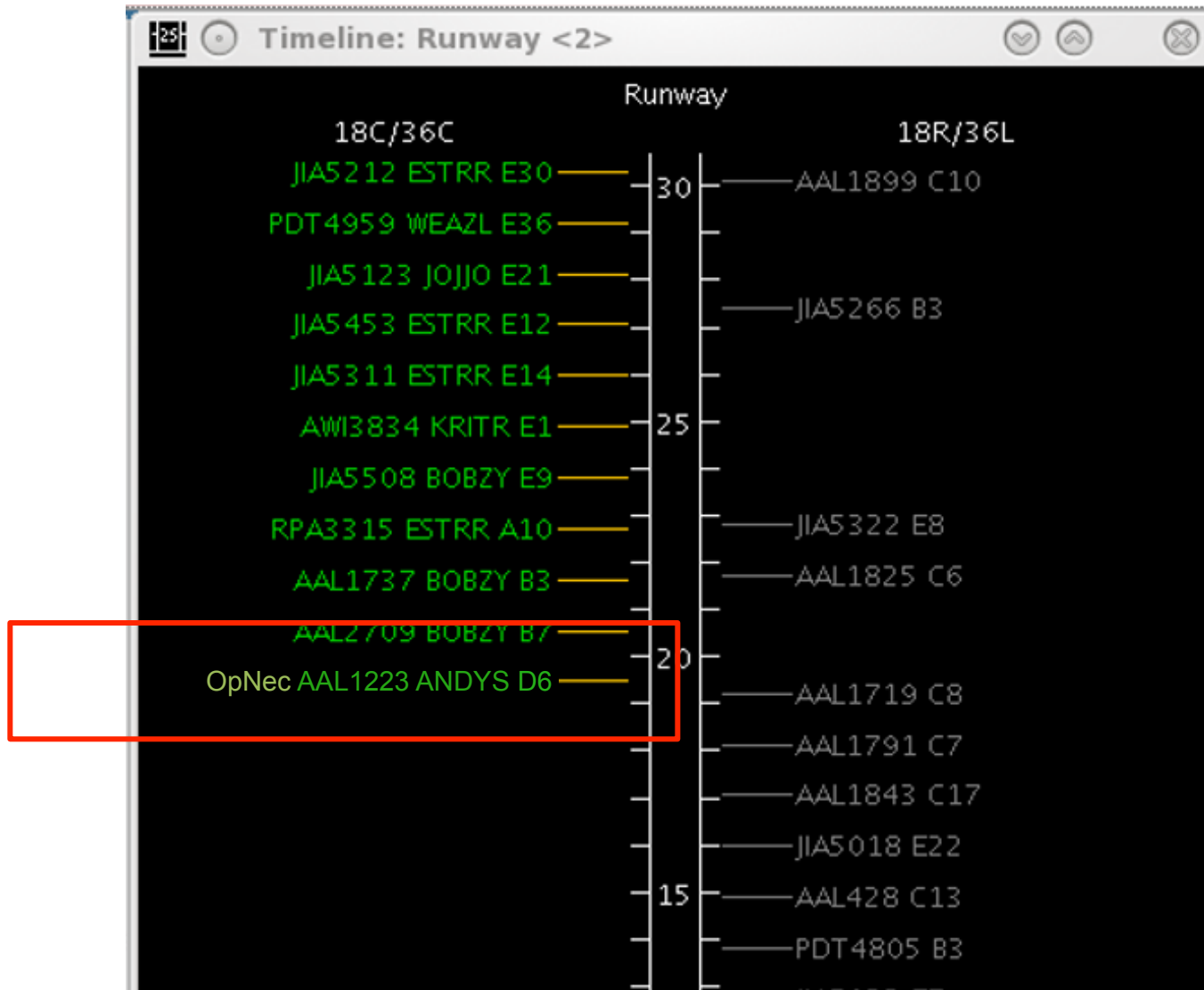
Cancel
Apply

Then Select this option and Apply

Select Apply to make the update

Taxi for Operational Necessity (Ramp)



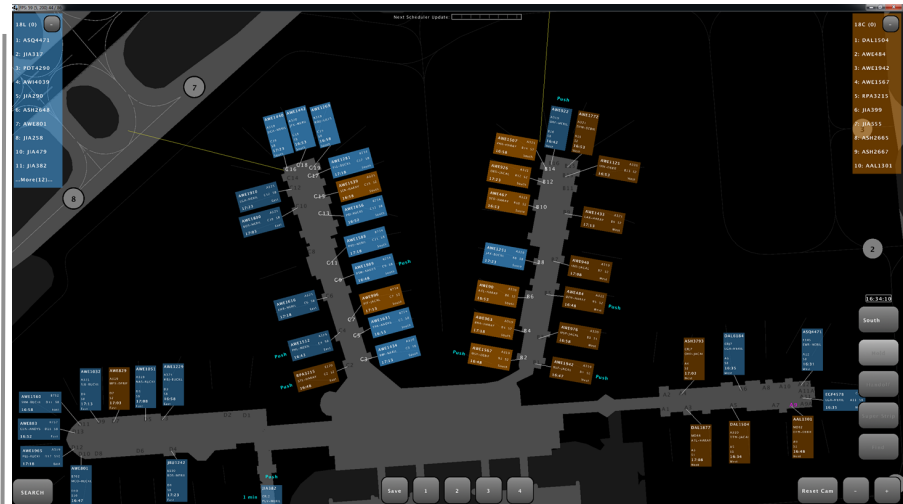


OpNec or TFON next to the ACID?

Previous HITL work

Tactical Surface Tools for Ramp (TSTR)

- Developed a HITL simulation environment to evaluate CLT ramp operations for the following:
 - Ramp Traffic Console (RTC) and Ramp Manager Traffic Console (RMTC) functionality
 - New CLT South adaptation and North Flows
 - Procedures to transition between different flows
 - Procedures to transition between advisory and non advisory mode



Ramp Traffic Console

Approach

- Human-In-The-Loop simulation at Future Flight Central (FFC)
- High fidelity AA Ramp operations with ATD-2 technology
- Simulated traffic – current day level in the non movement and movement area
- American Airline (AA) Ramp Controllers, AA Ramp Manager from CLT, and Retired Controllers

Highlights

- Tested with AA ramp controllers and ramp managers in the week of April 25
- Received positive and meaningful feedback from AA participants

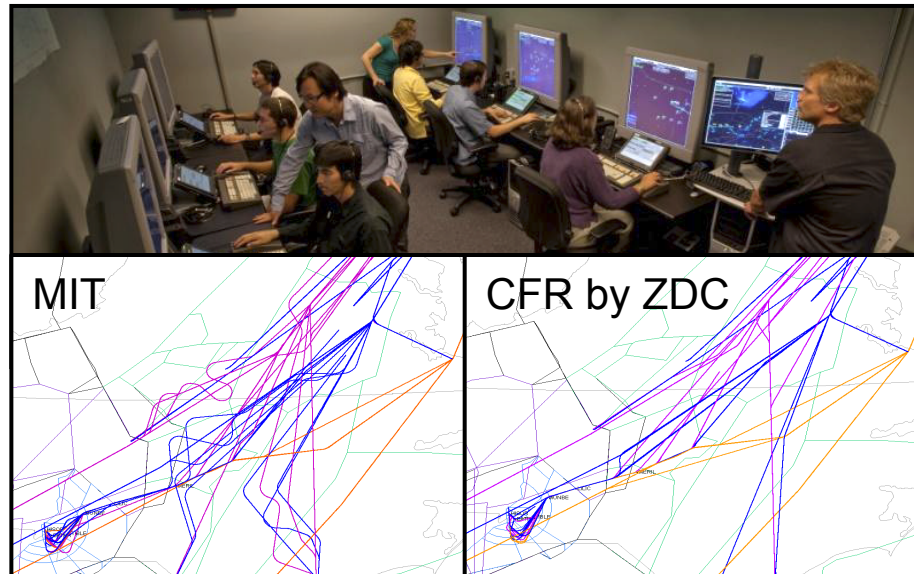
Look Ahead

- Plans to test the CFR procedures using ATD-2 tools between tower and center in summer

Charlotte EDC Evaluation & Demonstration (CEED)

Goals

- Develop a HITL simulation environment to test CLT ATC airspace operations
- Compare impact of current Traffic Management Initiatives (MIT & CFR) on departure and enroute operations
- Assess impact of 2 levels of compliance errors (partial/current and full) of target takeoff times on departure and enroute operations
- Evaluate operations and inefficiencies



Approach

- Human-In-The-Loop simulation at the Airspace Operation Laboratory (NASA Ames)
- High-fidelity ATC environment with current-day technology
- Simulated traffic of current-day departure push in CLT plus surrounding traffic in en route airspace
- Tested sectors with retired controllers from CLT, ZTL, and ZDC, pseudo pilots, and TMCs

Results

- HITL rated as very realistic by participants
- CFR departures led to less workload and airborne delays compared to MIT departures
- Surface delays were higher when ZDC scheduled CLT departures than when ZTL did
- However stream insertion was more efficient when ZDC controlled the departure schedule

Integration of Airspace and Surface Target Generators

1. Shakedown to test the integration between NASA's airspace and surface target generators
2. Evaluate the fidelity and accuracy of the Mini Tower showing CLT Tower Out of Window view
3. Evaluate the APREQ ping pong procedures using STBO and TBFM in current state
4. First opportunity to evaluate the Strategic Collaborative Decision Making (S-CDM) Tool

- STBO : Surface Trajectory Based Operations
 - Emulation of ASDE-X display (STBO TRACON map)
- Mini Tower showing CLT ATC-T out of window view
 - 270 degree view using 6 monitors
- Voice communication
- Flight Strips
- All the equipment held constant
- CLT TRACON represented by Multi MACS

@ FFC - Airport

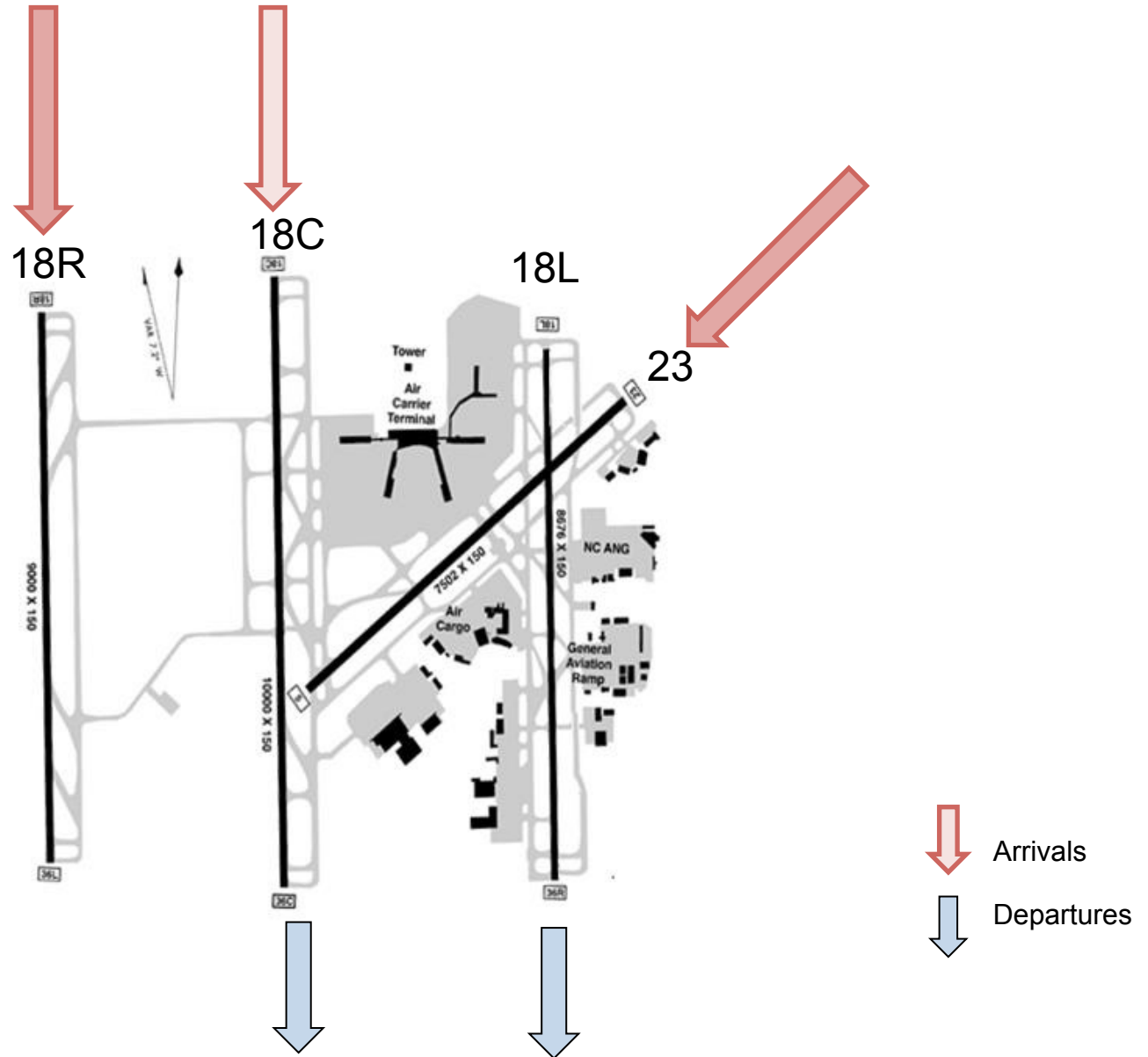
- One Local Center
- One Local East
- One Ground Controller
- One ATC-T TMC
- One Clearance Delivery
- Four Pseudo Pilots

@ AOL – TRACON and Center

- One Center TMC
- Two arrival controllers
 - Feeder West
 - Feeder East
 - Final ??
- Departures
 - Departure West
 - Departure East
- Five Pseudo Pilots

- South Operation with RWY 23 for arrivals
- No wind
- Clear visibility, IFR rules (can't fly visual in this sim)
- Duration 120min
- Arrival bank followed by a departure bank
 - 82 arrivals (21 turnarounds)
 - 74 departures (10 flights with CFR)
- APREQ/CFR to DCA, PHL, EWR, LGA, JFK from ZDC
- No TMI restrictions (EDCT, MIT)

South Converging Operations



Objective #1 testing the Airspace and Surface Target Generators

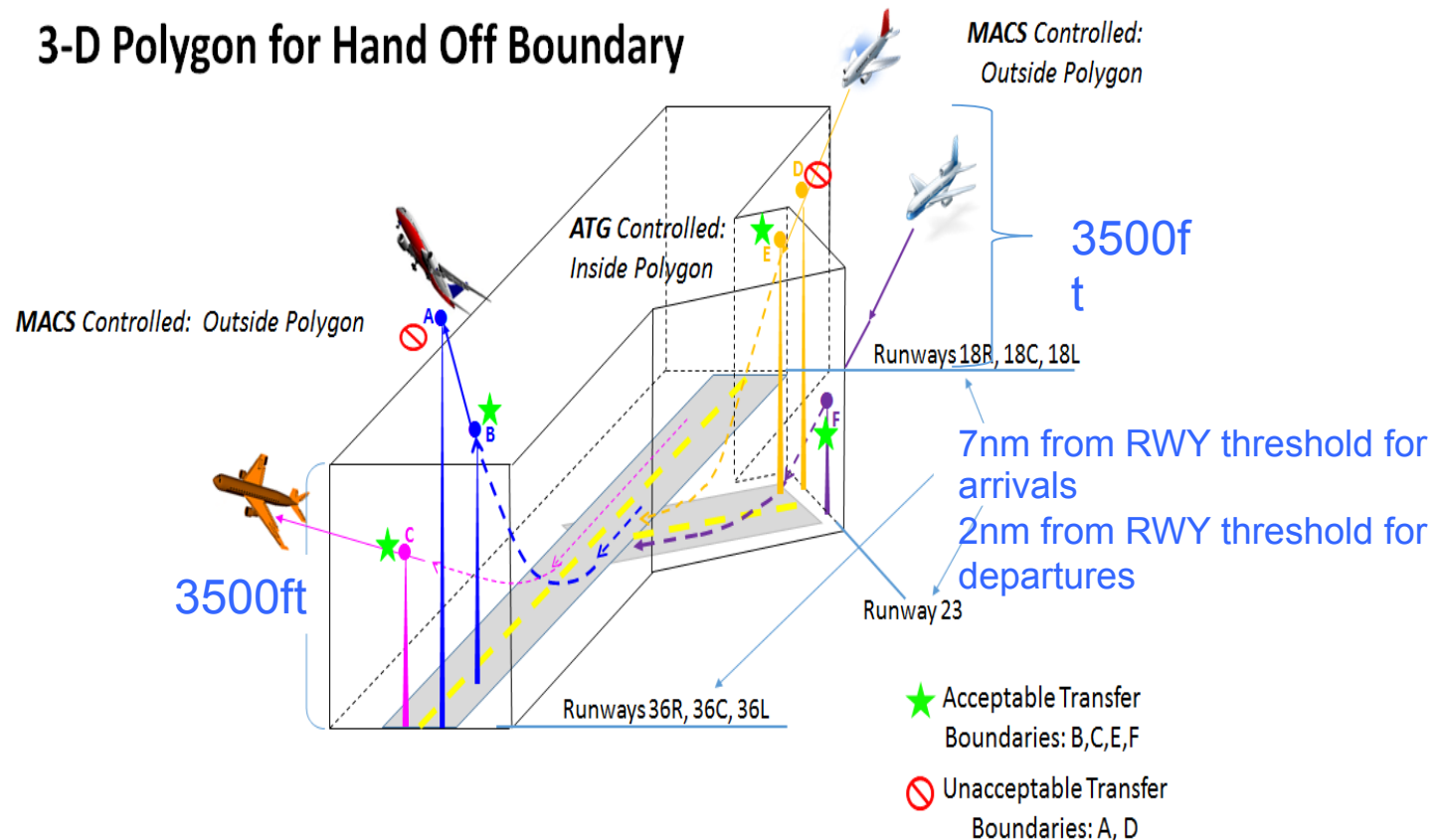
Hard boundary between ATG and MACS defined by polygon.

Once aircraft crosses the boundary the pseudo-pilots lose control of the aircraft.

Controllers need to hand-off control before the boundary depicted on the videomap.

Targets are still visible to both TRACON and Tower controllers on the radar display and the virtual tower

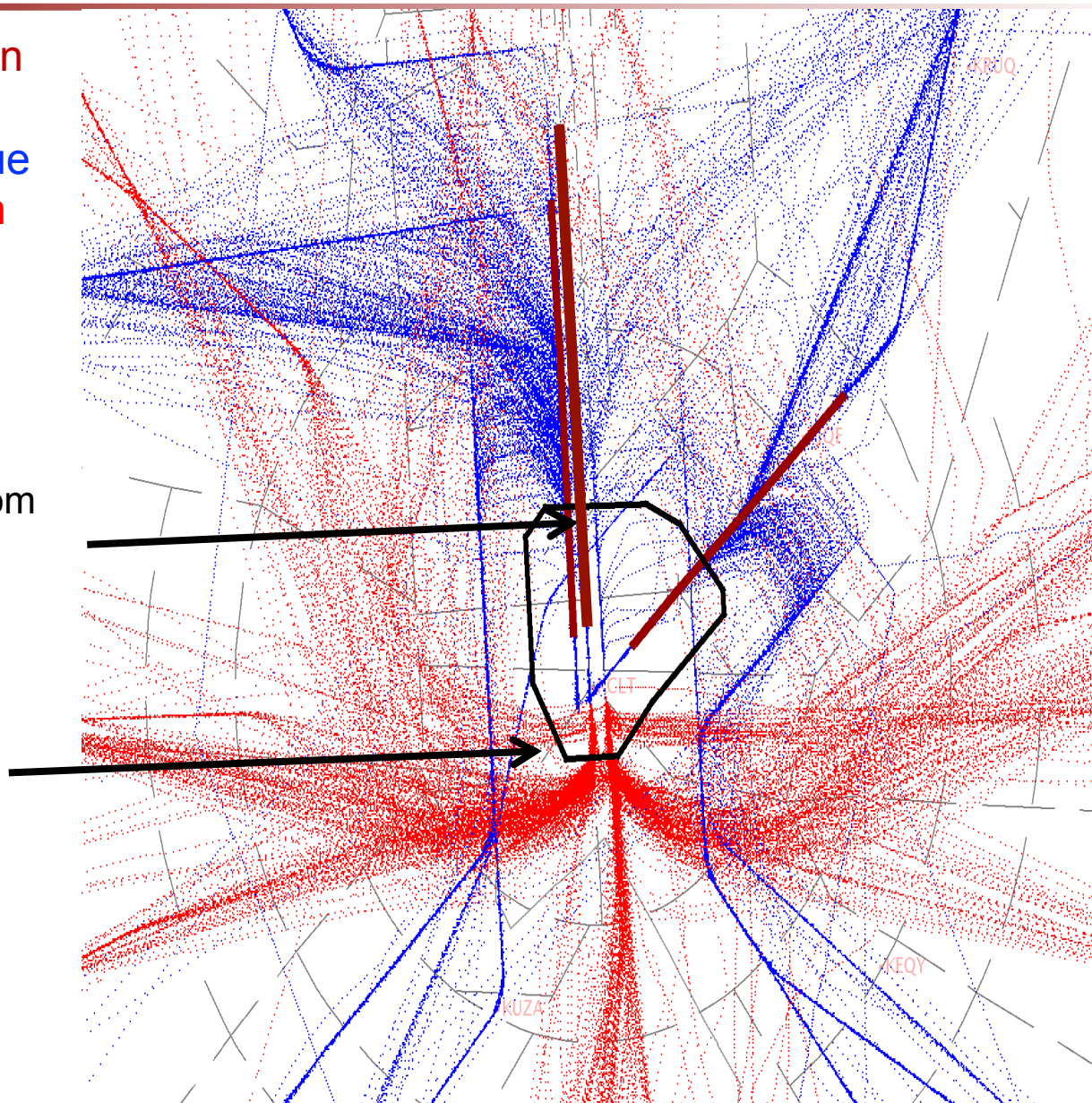
3-D Polygon for Hand Off Boundary



- Approaches in burgundy
- Arrivals in blue
- Departures in red
- MACS ATG handoff boundary

7nm away from
the RWY
threshold

2nm away from
the RWY
threshold



Objective# 3 APREQ Procedure

- STBO Timeline used to initiate APREQ process
- Center TMC will monitor TBFM for the APREQ aircraft
- TBFM will receive RFRT and accept
- STBO will receive release time for the aircraft
- Ramp will also receive the same release time on their tools

Objective# 4 Evaluate SCDM

- SCDM Tool depicts imbalance between demand and capacity
- It will show predicted queue lengths - metered and unmetered
- It may suggest a departure metering program that needs to be evaluated
- Several inputs into the capacity of the airport can be possible

- 08:30 – 09:30 Common briefing in Room 100
- 09:30 – 09:45 Familiarization in Tower and TRACON
- 09:45 – 11:45 Run 1 (50% traffic)
- 11:45 – 12:30 Lunch break
- 12:30 – 14:30 Run 2 (100% traffic)
- 14:30 – 15:00 Debrief